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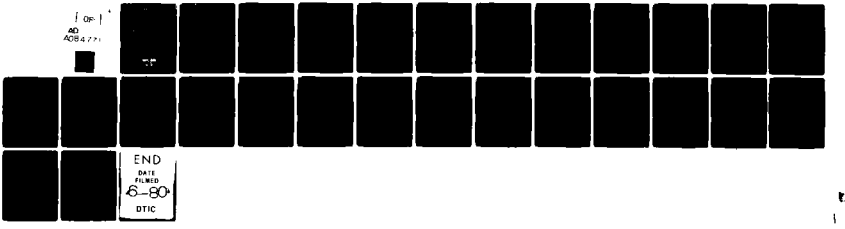

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ADOLPHE QUETELET
Prophet of the New Statistics

F. N. David

May 1980

STATISTICAL LABORATORY

University of California

BERKELEY

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Material assembled by Professor F. N. David for her public lecture of April 29, 1980 as a contribution to the celebration of the 150th anniversary of the independence of Belgium.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Adolphe Quetelet (1796-1874) was born in Ghent and was eventually a professor at the University there teaching mathematics, astronomy, geology, physics and history of science. He was almost entirely responsible for the Royal Observatory in Brussels being built in 1826, and became its director in 1828. An able mathematician, he was concerned also with the collection of data. In 1829 he drew up the plans for the Belgian census and in 1841 created the Central Statistical Commission. On a visit to London in 1834

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20. ABSTRACT (CONT.)

He became one of the founders of the London (later Royal) Statistical Society and was the first foreign member elected to the American Statistical Association when it began in 1839.

He devoted his whole life to showing how probability and statistical techniques could be utilized in the development of scientific research and in government administration. At the meeting of the British Statistical Association in 1841 he listed more than forty topics which he thought should be investigated using statistical methods -- including anthropology, criminal justice, meteorology, agriculture, zoology and man.

He was the first bridge over the gap between theory and practice of statistics and did much to create our modern statistical practices.

ADOLPHE QUETELET:

PROPHET OF THE NEW STATISTICS

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When I was a young thing at Grammer School we studied the history of England, classical Grèece and Rome, and, to broaden our minds, we studied what I might describe as the remaking of modern Europe, beginning with the Napoleonic period, and continuing through the century. It was in this connection that I first learned about the subject of my talk this afternoon, and my only qualm is that although he was a Belgian and was responsible to a large extent for molding and revivifying Belgian science, his thought and influence was not confined to Belgium, and we really should be commemorating a great European who was responsible in no small part not only for Belgium Today but for inspiring and expanding European thought.

I speak of Lambert Adolphe Jacques Quetelet, member of more than 100 learned societies, including the Royal Society of London and the Adademies of Berlin and St. Petersburg, one of the eight foreign members of the Academy of Moral and Political Science of the Institut of France, recipient of an almost innumerable number of decorations and honours. The thing of which he was most proud was that he was a Belgian. He was born in Ghent

on February 22, 1796, and died in Brussels on February 17, 1874. His father, who had traveled extensively about Europe as secretary to a Scottish laird, and who had spent enough time in the United Kingdom for it to be problematical as to whether he had acquired British nationality, came to Ghent on the death of his patron, married, and at the time of his son's birth was a town official of some sort.

Belgium at that time (1796) was part of the Napoleonic Empire. Its intellectual life had been strongly reinforced by the refugees who temporarily or semi-permanently had exiled themselves from France. I might add about these latter that it has often been declaimed about the Revolutionary and Napoleonic periods that the Sciences were never at war. Such theses as these are based on the flow of correspondence regarding their researches between scientists all over Europe and it is often overlooked that a not inconsiderable proportion of this correspondence concerns possible string-pulling to try to get fellow scientists out of jail. Napoleon was interested in Science -- as is witnessed by the number of scientists that he received as visitors to Paris -- but he did not put scientists to work on his armaments preferring to gain his victories by new tactical deployment which did not always work.

The poets and playwrights, who were particularly active in Ghent, studied and were inspired by the medieval songs and chronicles of Flanders. Several major poets of the new era lived there so the fact that the young Quetelet wrote verse and composed the words of a musical drama is perhaps not surprising.

Quetelet's father died when he was seven years old (1803). There was apparently enough money for him to attend school at the Lycée at Ghent. He did well at school and was clearly able in all forms of the arts, showing at a Salon at the age of 16 a drawing which was the subject of favorable criticism. However the family income could not have been extensive for at the age of 17 he obtained a post at a college at Oudenarde, where he was charged with carrying out a variety of teaching chores. We are told of him that while he had been very good at mathematics at school and while his teaching duties were mainly mathematical, mathematics occupied only second place in his inclinations. He looked on them principally from the point of view of the money which they would bring him from the giving of lectures and tutorials. His dream was to shine as a poet and a painter and he spent his spare time in various ateliers.

Quetelet returned to Ghent from Oudenarde after having stayed only one year and with no new job to go to. The fall of the Napoleonic Empire (1814) and the foundation of the kingdom of the Pays Bas caused considerable disorganization everywhere. A new city college was started in Ghent instead of the Lycée and early in 1815 Quetelet became the mathematics teacher there, at the age of 19. It was now that he came under the influence of Garnier and that his scientific career really began. William, King of the Pays-Bas, founded the University of Ghent in 1817 and Garnier was called from France to occupy the chair of mathematics and astronomy. Garnier made few significant contributions to mathematics but he was widely read and knew all the available sources. More importantly he had a lively and intelligent wit and knew how to inspire his pupils with the desire to learn. Quetelet, who wanted to

add to his scientific education said that Garnier's instruction really began when he had lost sight of the blackboard.

In July 1819 he passed the University's first doctoral examination ever with a dissertation in three parts -- one part astronomy and two parts geometry, including the invention of the curve which he called the "focale." The dissertation was an occasion of rejoicing by the professoriat of the University because of the impression which it made on the outside academic world and they set themselves to get the young man a place worthy of his talents. When M. Falck, the minister of public instruction, came in August to lay the foundation stone of the new university building, they recommended Quetelet to him with the result that Quetelet was named to a vacant chair of mathematics in the Athenée at Brussels. Several learned scientists had already been appointed there.

Quetelet did not, however, give up entirely the pursuit of letters for some time. He joined the Literary Society, for whom he wrote some poems, and became a member of a Committee concerned with the theatre, thus meeting many of the distinguished refugees who had fled from France with the Second Restoration. But these days mathematics was his chief occupation. Soon after arriving in Brussels, Quetelet contacted Commander Nieuport who had almost singlehandedly kept the interest in mathematical research alive in Belgium. Quetelet submitted a paper to the Academy of Science and Letters on further properties of the focale and Nieuport and Garnier combined to get him elected to the Academy in 1820 when he was only 24 years old. He followed his election up with several more geometrical papers presented over the next three years. The Academy is said, at this time, to have been at a

low ebb and to Quetelet is given much of the credit for its renewed activity and its contribution to the intellectual awakening which was taking place in Belgium. Quetelet was obviously a man of parts in that in addition to belle-lettres and mathematics, the Academy sent him in company with Kickx to write a report about the Grotto at Hahn.

The crucial episode in his life was now almost on him. Quetelet seems to have been a young man who possessed not only great ability and great charm of manner, but he also had an almost uncanny prescience in being able to see how various sciences might develop. Thus he know Mr. Falck, the minister for public instruction, because it was by his influence that he had obtained his Brussels post. So he went to Falck and spoke to him of the necessity of building an Observatory in Brussels. Quetelet had been interested in astronomy for some years -- part of his doctoral thesis was on an astronomy problem -- and he seems to have had little difficulty in persuading his Academy colleagues that an Observatory would be a good thing. So he was sent off to Paris in 1823 to find out what equipment would be necessary and how to work it.

He stayed only a few months but they must have been exciting ones for the young man. There he met Laplace, Poisson, von Humboldt, Fourier, Arago and Bouvard, and must have had his first initiation into probability theory. History does not relate, but it is obvious that also at this time he made his first acquaintance with Statistics and Epidemiology. Both the Lancet in London and the Annals of Public Hygiene in Paris were publishing statistical investigations of various kinds. In Paris was the famous physician Pierre Louis (1787-1872) justly described as the father of medical statistics and

there were many others. Laplace was playing about, without much success, with the fitti ıg of the normal curve to the heights of French conscripts. Arago and Bouvard were concerned with astronomy data. Quetelet seems to have absorbed all that was going on. He contributed an article to the Revue Encyclopedique before his return to Brussels where the Academy gave him the task of taking charge of the Observatory project. He was then 28 years of age. His work during the next ten years was phenomenal in output. The same year as his return from Paris (1824), he was given a chair of higher mathematics at the Athenée and he also started courses of popular lectures in experimental physics, astronomy, and probability at the Brussels Museum. The next year there were three new research papers in mathematics presented to the Academy and the beginning of the journal Correspondance Mathematique et Physique, in coeditorship with Garnier. (Six volumes were published between 1825 and 1830, Quetelet being the sole editor after the first two.) But 1825 was most noteworthy perhaps for the publication by him of the memoir "Laws of Birth and Death in Brussels" -- his first statistical demographic paper. All this time he was also negotiating for the creation of the Observatory which was officially approved in 1826. He was also organizing simultaneous observations on shooting stars to be made in Brussels, Ghent and Liege. I think he picked up the idea of simultaneous observations when he was in Paris and he was to put it to fruitful use in the years ahead. He presented three more research papers to the Academy, one being on the geometry of three dimensions and in addition he drew up a plan for organizing a Museum for Science and Letters and gave a course there on the history of science. What did he do in his spare time? Well, he found time to get married and to sire his first

child, his son Ernest.

Possibly after these frenzied three years he wanted a change. Anyway, in 1827 he took himself off to England to purchase equipment for the Observatory in London. He traveled a great deal about the United Kingdom visiting Universities and Observatories for about two months. He made the acquaintance of a great many English scientists among whom almost certainly were Charles Babbage and Thomas Malthus. On his return to Brussels he was shortly afterwards (January, 1828) named Astronomer of the Royal Observatory, Brussels. I noted his first demographic paper in 1825 and as the years went by he swung more and more to this side of science. This interest must have been accentuated by his English visit, for the English had been busy in this direction since 1662 and the talk would have been as to how to improve the census which was first taken in 1801. When Quetelet returned to Brussels from England he presented papers to the Academy called: "Population, Births, Deaths, Prisons, Poor-houses in the Kingdom of the Pays-Bas," and "Statistical Researches in the Kingdom of the Pays-Bas." This last work was divided into parts: Population, Taxes and Trade, Books and Journals, Education and Charitable Institutions, Comparisons between different parts of the Kingdom. The introduction was striking in that the author refused to confine himself to statistical tables but insisted that such tables were the only true base from which to study human societies. He ended by insisting that a complete census of the population was necessary. Such a census was decreed in 1828 to take place in 1830, and Quetelet acted as consultant to the Government on various aspects of the collection. And again, in case anyone wonders what he did in his spare time, we have a number of elementary texts -- 1826, Physics Course

in three volumes; 1827, popular treatise on Astronomy; 1828, Popular Instruction in the Calculus of Probability, this latter some 236 pages long. The treatise on Astronomy was put on the Index Librorum Prohibitorum by the Catholic Church, thus ensuring that it had a wide circulation.

When Quetelet was appointed Astronomer to the new Observatory in January, 1828 he gave up his chair at the Athenée and with it the concomitant teaching although he kept on with his popular lectures at the Museum for another eight years. One would have thought that to push the construction of the Observatory and the installation of the equipment would have been enough, but that same year he became a member of the Commission for the reorganization of public instruction. And he did not wait for the construction of the Observatory to be finished before setting himself to work. In September he started taking geomagnetic observations in Brussels and in a country house in Ixelles with a view to determining variation, and this led him on to try to get observations made outside Belgium. So he set off with his wife on various trips. Before going (1829) he presented to the Academy the last purely mathematical research paper that he was to write. His biographers note that his mathematical activity lasted ten years. Given that he did not seem too dedicated to mathematics as a young man one is perhaps surprised that the period lasted so long.

The first trip that Quetelet and his wife made in 1829 was to see Carl Friedrich Gauss (1777-1855) at Gottingen. Gauss had been interested in geomagnetism almost since Quetelet was born but had been too active in other directions to pursue the subject. Quetelet was born but had been too active in other directions to pursue the subject. Quetelet told Guass what he was

after. This was a new idea to Gauss and so they set up Quetelet's apparatus in Gauss' garden and conducted a series of experiments. Gauss is said to have been astonished at the results and said, "These observations conform to the precision of those in Astronomy." From January, 1831, the measurements that Quetelet had asked for were made regularly at Gottingen. Quetelet visited several other mathematicians and also spent eight days at Weimar with Goethe, who was then eighty years old. He and the young Quetelet obviously liked one another and there was a happy exchange of letters on his return to Belgium after the visit. He set out again almost immediately.

The Belgian revolution of 1830 caught Quetelet by surprise, or so it is said. He was in Rome when it happened, and he went on to Switzerland and France. He stopped at all the observatories and made geomagnetic measurements at each; these observations were presented in book form to the Academy of Sciences on his return. When he passed through Paris he left a paper describing his results which was published some years later (1833) in the Annals of Chemistry and Physics. On arrival at Brussels he found the Observatory far from finished, it having been occupied by the volunteer forces in the independence uprising. Further, and this in the circumstances is also understandable, administrative difficulties got in the way of the work proceeding.

There must have been a tremendous muddle for a few months during the splitting up of the kingdom of the Pays-Bas. From our point of view it was helpful in that Quetelet found time to catch his breath, and to turn his undoubted abilities to the consideration of many problems of the kind we would now label as sociological. For as the Astronomer to the University he,

presumably, drew a salary, and his formal duties must have been few. He set to work to try to sort out the laws governing the physical and moral development of man, and so in 1831 and 1832 we have papers, "Law of the Growth in Man," "Weight of Man at Different Ages," "Influence of the Seasons on Man's Faculties," and "The Inclination for Committing Crime at Different Ages."

It was perhaps the study of crime which led him on to what he called "social physics." He had already written (1828), in his Statistical Researches in the Kingdom of the Pays-Bas, "that what strikes one most is the frightening exactitude with which crimes occur. What a sorry state for the human race. The parts played by the prisons, the fetters, the death penalty, seem fixed with as much probability as the revenues of the state." He repeated these sentiments in 1832, adding that it was necessary to try to make a reduction in crime.

There were a number of scientists at that time who were already interested in some of the aspects of the matters on which Quetelet wrote -- Laplace playing about with the heights of French conscripts, and Malthus with his concern for world demography, to mention only two. And previously for nearly 200 years men had been looking at birth tables and mortality tables. Counting seems to have been alright for economic purposes, or to find out how large an army could be mustered, but to look at sickness and death, even if it was with the idea of trying to enact legislation to improve things, was to be accused of questioning the inscrutable purposes of God. This intellectual taboo had decreased from the era of John Graunt (1662) but it was still strong in Quetelet's time. There was also the reluctance of the natural and

physical sciences to have anything to do with the social sciences, an attitude of mind which still persists. Thus in 1835, a committee of the French Academy of Sciences reported against any numerical method in medicine "for each patient has his own individuality, problems in medicine are always individual, the facts presenting themselves for solution one by one, the treatment in each case depends on a happy instinct supported by numerous comparisons and guided by experience." The great mathematician Poisson was a member of this committee.

So Quetelet did not face a scientific world entirely at ease with his new ideas. It is true that Laplace had written in the preface to his book on probability theory that "frequency regularities" imply "constant causes" in the world of the social side of humanity, and had hinted that a "moral science" might be developed, but he did little about it and Quetelet had really only isolated attempts by many scientists to solve particular problems as his forerunners. Where his true genius lies is that he saw that by correct enumeration, any "natural law" could be investigated and while we would not perhaps follow him down the path of the "average man," we must pay homage to his perspicacity, breadth of vision and statistical insight. Thus we have him traveling about Europe persuading astronomers and geophysicists to take various types of measurements with the insistence that these be made in the same way at the same time. While on his travels, he realized that the same dictum held for the study of vital statistics and he added it to his list of objectives. In 1828 he became a correspondent for Brabant in the Statistical Commission headed by E. Smits and remained a member after the division of the Pays-Bas. He and Smits were responsible for the report on

the Census written in 1832. But astronomy, geophysics, vital statistics, demography, and the social sciences did not be any means exhaust his interests.

The British Association for the Advancement of Science -- always familiarly and affectionately referred to as the British Ass -- met first in York in 1831. It met every year and in 1833 Quetelet received an invitation to attend as the official delegate of the Belgian government. The meeting was at Cambridge, so Quetelet went off there, stopping on the way to deliver a lecture on mortality statistics in Paris. This Cambridge meeting was one which was fraught with significance for the development of Statistics. English statisticians were by and large to be found in the ranks of the economists. This was entirely suitable for a country that Napoleon Bonaparte had contemptuously described as a nation of shopkeepers. Quetelet, on the other hand, was interested in statistics about anything and everything and, in fact, took with him to Cambridge a list of many subjects which he wanted his compères to be persuaded would be amenable to statistical investigation. The subjects ranged from the birth, death and criminality of man right through meteorology and bioclimatology, the latter in order to be able to predict when wheat would be ready for harvest and when flowers would bloom. It says much for his charm of manner, persuasive powers and the fact that he was previously acquainted with many that he was able to get his ideas across.

Quetelet found that the British Ass was divided into five sections (A through E) and that there was no appropriate section where statistics could be discussed. Quetelet seems to have conferred with Malthus, Richard Jones, a factory commissioner, a member of Parliament, and Charles Babbage. He

appears to have been on friendly terms with both Malthus and Babbage. Babbage was interested in statistics from the point of view of the economics of machines and his and Quetelet's lists of what might be accomplished by statistical investigation did not coincide. After much discussion between all interested parties, Babbage suggested that they should declare themselves the sixth section F of the British Ass. The general assembly didn't like this too well but accepted it subject to the proviso that "inquiries of this section are restricted to facts, relating to communities of men, which are capable of being expressed by numbers." The audiences attending the meetings of the new section F were comparable in size with those attending other sections.

Thus Quetelet with his interactions with the English scientists had started the ball rolling and eventually after he was back in Belgium, further meetings of interested parties were held in London and the London Statistical Society was formed in 1834. But Quetelet did not quite understand the English. On his way back to Brussels he was asked to testify before a parliamentary committee about the registration -- births, deaths, and so on -- of statistics. In answer to a question as to whether the English were in a state of destitution in such matters, he replied at length stating "the very basis on which all good legislation must be grounded has never been prepared." When the Statistical Society was finally formed with the help and approval of government statisticians, the Tories attacked this statement and others he had made, and the Statistical Society was landed with the following: "The Statistical Society will consider it to be the first and most essential rule of its conduct to exclude all Opinions from its trans-

actions and publications -- to confine its attention rigorously to facts -- and as far as may be found possible, to facts which can be stated numerically and arranged in tables." Quetelet was elected at once a member of the Society and in the same year a corresponding member of the British Ass.

Did this Cambridge conference contribute anything to Quetelet's development, or was it all one-sided? Well, Malthus died that year, so it is likely that conversations Quetelet had with him, recorded many years later, took place at the conference. Quetelet wrote about the subject of these conversations:

> Statistical documents should be exact and comparable. Comparison cannot be established in the limits of a single kingdom. Different figures are employed to express the same things and nearly always dissimilar classifications when the most rigorous uniformity is necessary. This is especially remarked in classification by ages, in dividing the populations into different professions, in the nomenclature of diseases, and in that of crimes made known to tribunals . . . . These disparities are so many obstacles to the progress of statistics.

We should apologize to his shade since we are not there yet, though we are trying. He clearly saw what was needed.

Arrived back in Brussels, he went home to the Observatory which had started up in 1832 although personnel was sparse. Before going to England he had instituted observations on sun-spots and on his return he created the publications, the Observatory Year-Book and the Annals of the Observatory, where the sun-spot observations were published along with others to which they had led. He was offered a professorship at the new free University of Brussels but refused. He was then elected perpetual secretary of the Academy that same year (1834).

I always have the feeling about Quetelet that sometime he must stop to take breath and maybe he did just now, although I rather doubt it. But surely now his lifework must have become apparent to him. There was the work at the Observatory with observations to be made and conclusions to be drawn not only about the stars but about climate and the tides of the sea. There was the work at the Academy. There were the various statistical investigations concerning the human race and its behavior. And of course, just as a makeweight perhaps, professorships entailing teaching courses such as that he accepted at the new Ecole Militaire in Astronomy and Geodesy in 1836. Here indeed we have a man for all seasons. 1835 was a period of more than usual activity for him. On becoming Perpetual Secretary to the Academy he occupied himself with setting the Academy records in order, in publishing a Yearbook of the Academy, and in writing "Summary of the actual state of mathematical sciences in Belgium," a paper which was presented to the British Ass. in the next year, 1835. Quetelet was immensely proud of being a Belgian and proud of the enormous strides which Belgium was making in teaching and in developing the sciences. So the paper was probably a writing down of all the things he had told his English friends during his Cambridge visit. He also carried out promises that he had made and 1835 saw observations made on tides on the Belgian coast -- taken at the request of William Whewell, Professor and later Master of Trinity College -- and hourly meteorological observations made at the time of the solstices and equinoxes -- taken at the request of Sir John Hershel, friend of Charles Babbage. It must have been about this time when he added a passionate interest in the periodicities of terrestrial phenomena -- he probably caught it from Fourier --

to his two other hobby horses of multiplication of observations at the same time and different places and of the standardization of nomenclature for statistical categories. But 1835 will chiefly be remembered as the date of the printing of his work in four volumes: On Man and the Development of His Faculties; or Essay on Social Physics (later to be dubbed by August Comte in 1838 as Sociology). This is the work which gave incalculable impetus to the scientific world and made Belgian Science -- at least in the social physics sphere -- a world leader. The four volumes were divided into physical attributes, moral attributes, intellectual attributes, and a study of the average man in the social system. I recall with a smile the London Statistical Society the year before being denied any right to Opinions and forced to adopt for its crest a wheatsheaf with the motto "Aliis Exterendum" -- to be threshed out by others. Quetelet was entirely and wholeheartedly in favor of the concept of what he styled "the average man." "Man carries, from birth, in more or less the same proportions, the elements of all the attributes that eventually develope. We have set down divergencies when they exist but these prove the existence of a general law of development. I believe it is not only not absurd to postulate this but even that it is possible to determine the average man of a nation or of the human race." Again we have, "Man without knowing it and while he thinks he is acting with his own free will, is subject to certain laws . . . . that he does not suspect . . . . If the average man was determined for a nation, he would represent the type of that nation; if it were possible to determine him for the whole set of men, he would represent the type for the whole human race." Now whether we agree with this kind of approach towards solving the troubles

of mankind is at this point in time irrelevant. The important thing to notice is that in his writings we are given a theory, we are given observations, and we are given fumblings towards the idea that there should be some agreement between observation and hypothesis -- this latter an idea which has not yet been accepted by many even today. Quetelet did not produce any new statistical theory. Given the way in which he spread himself I would have been very surprised if he had. He followed the well worn path first put forward by DeMoivre and attempted the binomial law under various guises. But, and this is true with much that he did, he foresaw what was needed to make commonsense of the data of experience even if he could not carry out his ideas. Probably the Essay on Social Physics was the most important book for us during the whole nineteenth century, not for what it achieved but for the signposts which it set up for Quetelet's contemporaries and their successors.

Having, as it were, cleared his mind by setting his ideas about the average man on paper, Quetelet turned his restless intellect to other things and did not return to the topic for at least ten years. He set himself to celestial and terrestrial matters. In 1837 we have a catalogue of shooting stars, the flowering of plants in 1839, on magnetism and on temperature in 1840, on meteorology in 1841 and a volume On Global Physics in 1842. This last was an attempt to tie together global physics -- temperature, magnetism, meteorology -- with the flowering of plants and the behavior of animals, fishes and insects, and it won him considerable praise all over Europe. Special reports on it were made to the British Ass. by Wheatstone and to the Royal Society by Faraday. As usual, the purpose of his writing was to

encourage the taking of observations for the recording of natural phenomena. The year before the publication of Global Physics (in 1841) Quetelet went to the meeting of the British Ass. in July at Plymouth and had inserted in the Proceedings a table of the Principal Phenomena to be observed -- 8 in meteorology, 7 in physics, 2 in chemistry, 4 in botany, 5 in agriculture, 6 in zoology and 10 in man. And we have the remark, "The idea of filling this gap in science has long made me sensible of the necessity of establishing as complete an enumeration as possible of periodical phenomena. I have thought it useful to submit it to the learned." At the same time, Quetelet thought it time that the Belgians should all tell the same time. So between 1838 and 1839 -- at government request -- there were small telescopes set up in five towns outside Brussels, 41 sundials in other towns so that everyone told the same time. We also have an accurate determination of the difference in longitude between Greenwich and Brussels. And as if this was not more than enough for one man to encompass, he was lecturing on astronomy and geophysics at the Ecole Militaire, he was tutor to the Saxe-Coburg princes during their visit to Brussels, 1837, and the government sent him in 1839 on a mission to France to report on the conformity of the weights and measures standards of Belgium with those of France. During his visit he took the opportunity to make some geomagnetic measurements.

Quetelet had been pressuring the Belgian government for some time to set up a central statistical commission. The commission was created by the minister Liedts in 1841 and since he had been a pupil of Quetelet's in the far-off days when he taught at Oudenarde it was natural that he should appoint Quetelet as its president. In his capacity as President,

Quetelet put forward a proposal to take a general census in 1846 of populations of men, of industry, and of agriculture. He is said to have taken an active part in the preparations for this census, publishing an article describing previous censuses.

This appointment possibly quickened his ideas about moral and political science and turned him again to social statistics. In 1845, some eight years after his tutoring, he published in book form the well known Letters to H.R.H. the Grand Duke of Saxe Coburg and Gotha on the Theory of Probabilities Applied to the Moral and Political Sciences in which he wrote down what he had tried to teach the young princes. The first nine letters treat elementary probability, the thirteen following deal with means and limits, eleven more on the study of causes -- constant, variable and accidental -- and the last eleven on the utility of statistics, dealing for example, among other things, with the mathematical relation between the fares paid on the railway and the number of persons travelling. Statistics to him was the force, both social and political. Obviously following from this there are several memoirs on free will in the next three years culminating in 1848 with further ideas about the average man under the title "The Social System and the Laws which govern it." He tried to show the correlation between physical characteristics and the mental aptitude of man.

Quetelet seems to have been uninterested in politics. The happenings in Europe in 1848 drew from him two papers about the intervention of governments in people's affairs -- he was against it but these papers are not noteworthy except that they seem to be the only purely political

papers that he ever wrote. Again having cleared his ideas about the average man with his further ideas about the social system and mortality tables (1851) and tables of measurements of different parts of the human frame, he temporarily turned his attention elsewhere. Probably the suggestion regarding "atmospheric waves" came from Sir John Herschel. But Quetelet organized the Belgian scientists, and later the Europeans, to take hourly readings of barometric pressures, which led to the advancement of knowledge regarding storms. Quetelet wrote a memoir called "On the Belgian Climate" and when Matthew Maury of Washington suggested an international conference to secure uniformity of measurement and so on, Quetelet took up the suggestion with enthusiasm. It was clearly what he had been preaching with regard to all systems of measurement and he induced the Belgian government to hold a conference in Brussels in 1853 "to establish a uniform system of meteorological observations for the sea." Quetelet was the elected president of the conference.

As I have remarked several times, one of the main driving forces of Quetelet was the recognition that statistical knowledge -- and therefore to him social and economic improvement -- would only come through international cooperation. He went to London, with the approval of the Belgian Central Statistical Commission and met with scientists attending the Great Exhibition in Hyde Park in 1851. He put forward his international ideas, they liked them, and it was decided that the first international statistical meeting should be held in Brussels because of the excellence of Belgian statistics. Quetelet was given the task of organizing the meeting and he got the Belgian government to designate it as an International Statistical Congress with

sectional organization and questions for discussion. The government was responsible for the invitations. The Congress met in Brussels in 1853 and Quetelet was elected President, a position which he held until his death. His presidential address dealt with the need for some sort of unity of terminology in official statistical publications. The Congress was clearly a tremendous success since it kept on meeting all through the century, and its influence on the statistics of government -- the bread and butter work that rules all our lives -- was immeasurable. As usual Quetelet wrote a paper for the Academy, after this first conference, on the influence of academies, congresses and scientific conferences. So in 1855 we have a scientist who through personal charm, immense intelligence, and an inordinate capacity for hard work, had accomplished more than any ten other men in pushing the reluctant along what he conceived to be the right road. Perhaps he had been happy doing it; probably given his career he had not stopped to think about personal ambition but had driven himself as if possessed by a demon from one task to the next. The years from 1819 to 1855 were undoubtedly his career. And now Nature called a halt.

In July, 1855, Quetelet suffered a mild apoplexy -- a head stroke. He was found unconscious at his desk. As might be expected this did not conquer him. He set to work this time to frustrate his physical misfortune and because of his affectionate subordinates and his loving wife he succeeded to a remarkable degree. However his memory, which had been sharp and accurate, never really recovered. His prose from being lucid and compelling became bungling and inadequate, with unfinished sentences. This handicap he eventually overcame, although for a time his subordinates had to rewrite

his work. Worse still, he was aware of these things and he began to be suspicious of people who he thought did not pay him sufficient respect. He might have recovered completely had it not been for the death of his wife and daughter. As it was, the remainder of his life brought little that was new to the scientific world and the outpourings of books and papers were merely revisions of his previous output. His son, Ernest, an able astronomer in his own right, took over the direction of the Observatory, although Quetelet remained the titular head until his death. Quetelet limited himself to meteorology, geophysics and statistics.

Quetelet lived 19 years after his head stroke and when he had gained some sort of cohesion he played a useful part in the revisions of his books and in the influence which he had over the statistical world, particularly the English. Unable to preside over the 2nd Statistical Congress -- held in Paris -- because of his illness, he presided over the rest -- Vienna (1857), London (1860), Berlin (1863), Florence (1867), The Hague (1869), and St. Petersburg (1872). At this last session, the members voted not to have any more congresses, but to create an International Statistical Institute with permanent headquarters and this still exists today. So he lived to see part of his dream become reality.

He must have started on his global work fairly soon after his illness for he came out with Global Physics in 1861, a revision of his previous work with additions, a book on the meteorology of Belgium compared with that of the world in 1867, a second edition of Social Physics in 1869, and in 1871 Anthropometry or measurements of the different faculties of man; this last a resume of the measurements he had made between 1849 and 1853

on different parts of the body. In addition he made mortality tables -- mortality tables of Brabant 1859 mortality tables in 1866, on mortality during the first year of life 1864, mortality tables and their development 1872. There were also a large number of papers comparing and contrasting the statistics of different countries.

A vast amount of computation must have gone into all this work both before and after Quetelet's illness. There was some talk with Babbage over the development of a computing machine in order to reduce census data but this didn't come to anything. As early as 1838 we have Babbage writing to Quetelet: "I have been so heavily employed on the great Calculating engine that I have neglected my best friends." So one supposes that all the enormous astronomical, geophysical and statistical computations were carried out by mortals toiling with books of logarithms, books of multiplication tables and probably the then modern equivalent of the abacus. It is strange that we who have so much produce so comparatively little.

The two volumes which did not require any computation but which must have given him satisfaction as a patriot were the 1864 History of Physics and Mathematics in Belgium and the 1866 Mathematics and Physics in Belgium During the 19th Century. These are very much expanded versions of the paper he sent to the British Ass. in 1835.

I should not end, I think, without speaking briefly on Quetelet's influence on the development of statistics in England. I have noted his friendship and influence on Babbage and Malthus and to these I could add William Farr, the first real epidemiologist. But I must also add two more: Florence Nightingale, who almost singlehandedly reformed the health of the

British Army, and Francis Galton with his Hereditary Genius and the developments from it. Florence Nightingale's official biographer writes: Few books made a greater impression on Miss Nightingale than those of Adolphe Quetelet. A copy of Quetelet's Social Physics had been presented to her with the author's hommage, respect and affection. She often spoke of Quetelet in similar terms. His book was in her eyes a religious work -- a revelation of the Will of God. In her annotated copy she enlarged the title. The book was not merely an Essai Du Physique Sociale. It exhibited "the sense of Infinite power, the assurances of solid Certainty and the endless vista of Improvement." She wrote to Galton:

> You know how Quetelet reduced the most apparent carelessness to ever recurring facts, so that as long as the same conditions exist, the same "accidents" will recur with absolutely unfailing regularity. You remember what Quetelet wrote -- and Sir John Herschel reinforced the advice -- Put down what you expect from such and such legislation. After x years see where it has given you what you expected and where it has failed. But you change your laws and your administering of them so fast and without enquiry after results past and present, that it is all experiment, see-saw, doctrinaire, a shuttlecock between two battledores.

Perhaps that should be posted in every politician's office.

Quetelet was writing to Florence Nightingale until a few months before his death, and she was exhorting him to get on with preparing new editions of his books because the first editions were exhausted. He went off in 1872 to the St. Petersberg Statistical Congress and was received everywhere with great acclamation and honor. However, in 1873 when he was asked to organize a similar congress for meteorologists in Vienna, he did not feel up to it, although this was one of the things for which he had worked, and he was

represented by his son. His plan for the observation of terrestrial phenomena was the central theme of the Congress. In spite of his refusal to go to Vienna, there was nothing to indicate that his end was close. The eclat with which he had been received at St. Petersberg had had a happy influence on his morale and he appeared rejuvenated and continued to work in a tireless way. However, in January 1874, he caught pneumonia and died on February 17th. His biographer and friend wrote in his eloge:

> The loss of Quetelet has been vividly felt. His writings had put him in rapport with savants of the whole world. His correspondence was immense. He was known personally to the greater part of those men who have made a name in science, letters and the arts whether he had met them on trips to England or on the continent of Europe, or whether they had visited him at the Observatory . . . . Belgium should be proud of such a man.

And we might add not only Belgium but the rest of the world. It has always been said that the stability of government rests not with the politicians but with the permanent civil servants. For politicians may come and go, but the permanent civil service is permanent and there is little politicians can do to alter what type of information it collects and how it collects it. Quetelet's lifelong crusade made it almost certain that information for government was collected properly and in a way that made in interchangeable between nations. We all owe him a trememdous debt of remembrance and gratitude for his inspiration.